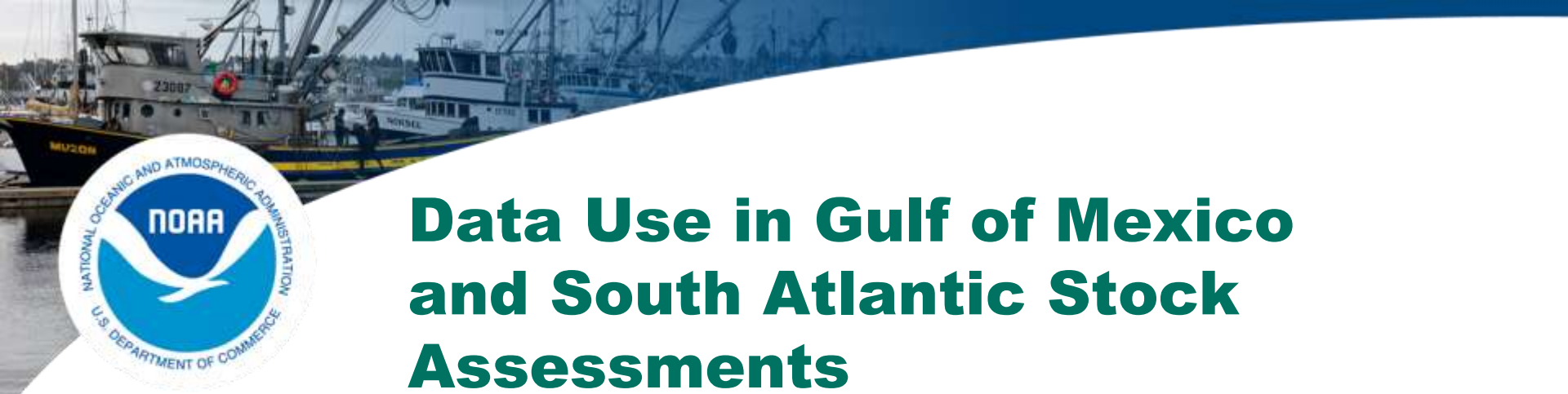


Data Use in Gulf of Mexico and South Atlantic Stock Assessments

NOAA FISHERIES

SEFSC

SEFSC PROGRAM REVIEW

June, 2013

Relevant Council Jurisdictions

Figure 1. SEFSC's laboratory locations and jurisdictions that cover areas of responsibility for three Fishery Management Councils and Atlantic Highly Migratory Species. Inshore and coastal habitats are under the jurisdiction of eight southeastern states, Puerto Rico, and the U.S. Virgin Islands.

Fisheries

(> 100 stocks in FMPs and > 700 harvested)

Recreational Fisheries

Nearly 6 million fishermen

More than half of all angler trips in US

Commercial Fisheries

20% of national value of landings

Data: Richest in SE, but not “Data Rich”

Fishery Statistics

- Landings
- Discards
- Size composition
- Age composition
- CPUE (standardized)
- Shrimp bycatch

Fishery independent surveys

- Size composition
- Age composition
- Relative abundance indices

Stock Assessment Models Used

- Statistical catch at age (BAM, Stock Synthesis)
- Virtual Population Analysis (King mackerel)
- Production models (size/age comp. unreliable)
- Catch-free (goliath grouper)
- Data-poor (mean-length, DCAC, ORCS)

Stock Assessment Models – Important Data

- Index of Abundance (SCAA, VPA, Prod.Mod, Catch-free)
  - Tracks changes in stock
  - Preferably covers full range of stock
  - Preferably from Fishery-Independent (FI) data
- Total removals each year (SCAA, VPA, Prod.Mod, ORCS)
  - Accurate accounting of all landed and dead discarded fish
- Age Samples (SCAA,VPA)
  - Age-structure of landed fish for each year, by fleet
  - Age-structure of FI index fish for each year

Stock Assessment Models – Important Data

- Life History Information (SCAA, VPA, Catch-free, mean-length)
  - Measures of maturity rates and reproductive output
  - Growth curves, weight-at-age, etc.

- Length Samples (SCAA, mean-length)
  - Not as informative for many of our tropical, fast growing species

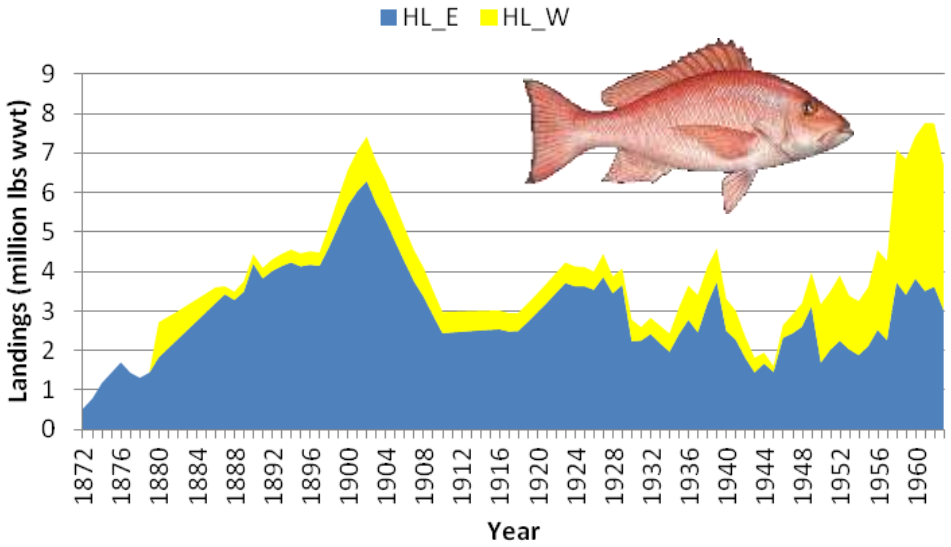
Available Fishery Dependent Statistics

- Landings
- Discards
- Size composition
- Age composition
- CPUE (standardized indices)
- Shrimp bycatch

Commercial Landings (1880-)

- Census

  (but not in all years prior to 1964)

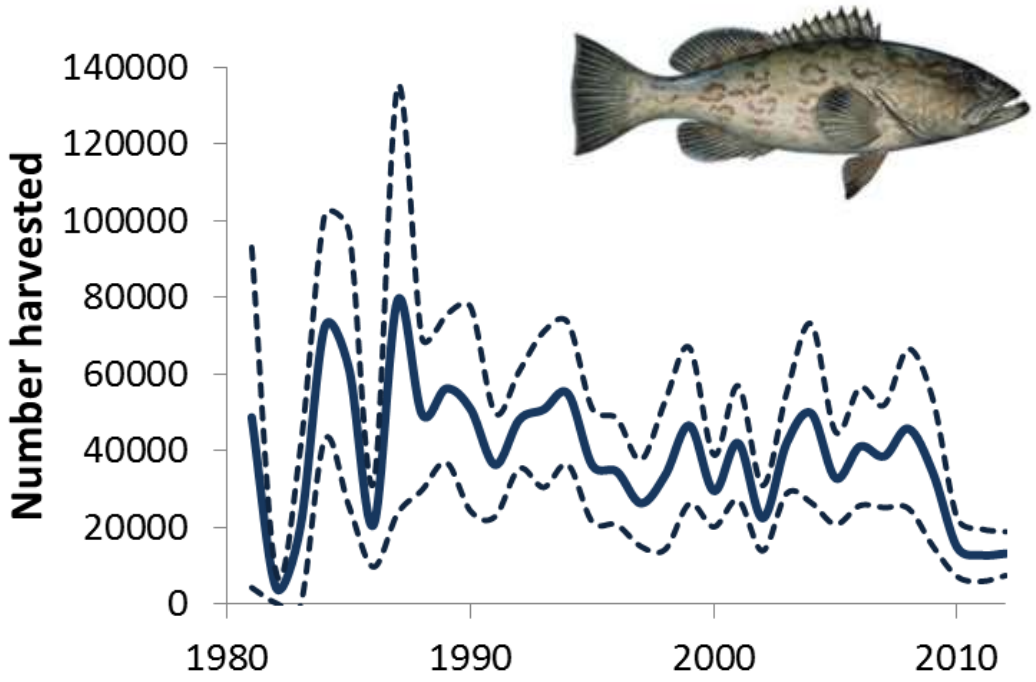


- Location fished

  (self-reported, missing in most years prior to 1964)

Recreational Landings (1981-)

- Surveys
  - MRFSS/MRIP
  - Headboat survey
  - TPWD
- Imprecision/Bias
  - Low intercept rates for some species
  - Self-reported effort
- Location fished
  - Self-reported



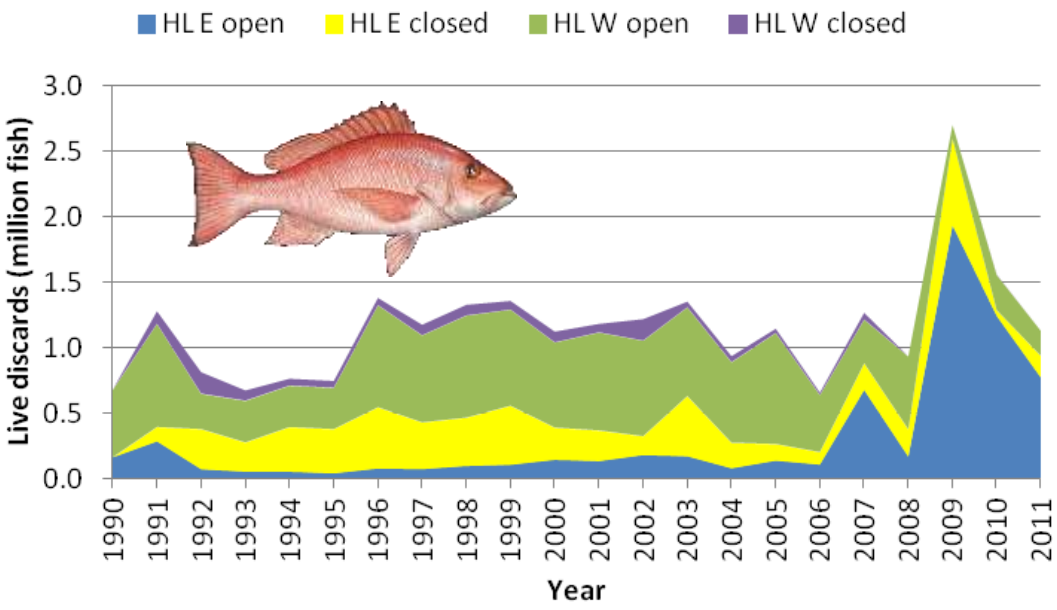
Commercial Discards

- Logbooks 1990-

  Self-reporting

- Observers 2007-

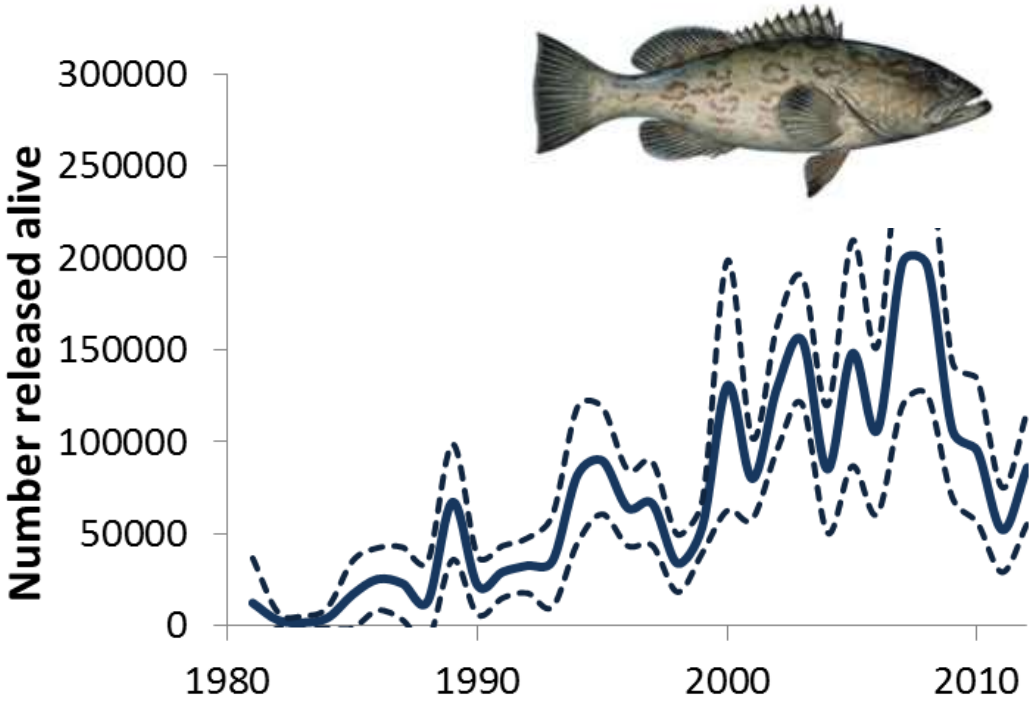
  Low coverage



- Discard rates calculated from logbook or observer data and applied to self-reported total effort from log books

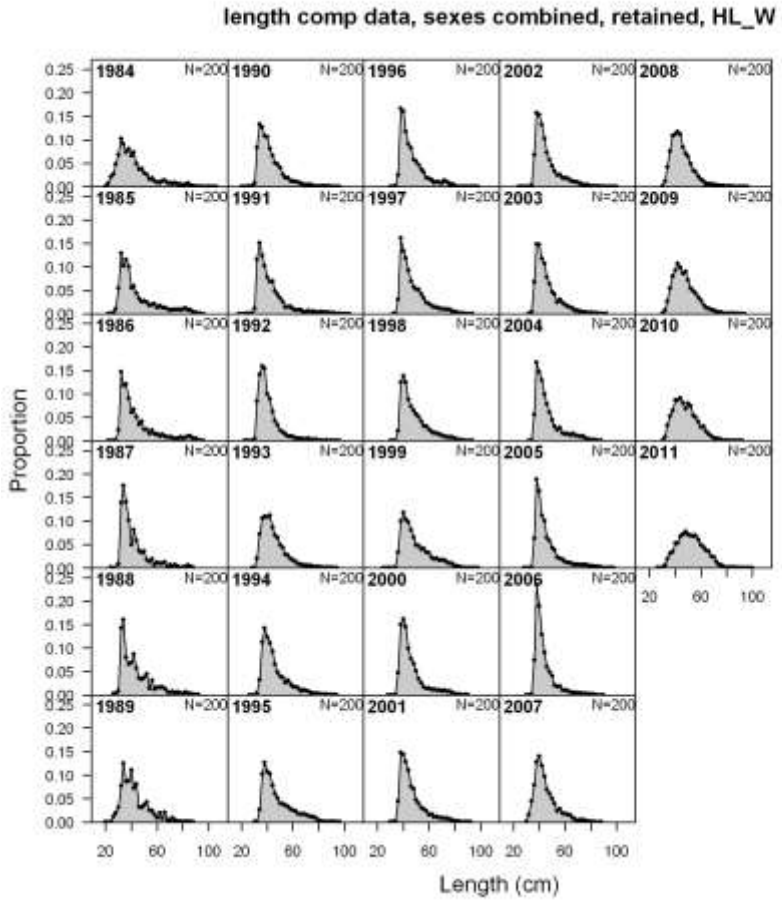
Recreational Discards (1981-)

- Surveys
  - MRFSS/MRIP
  - Headboat survey
  - TPWD
- Imprecision/Bias
  - Low intercept rates for some species
  - Self-reported effort
- Location fished
  - Self-reported



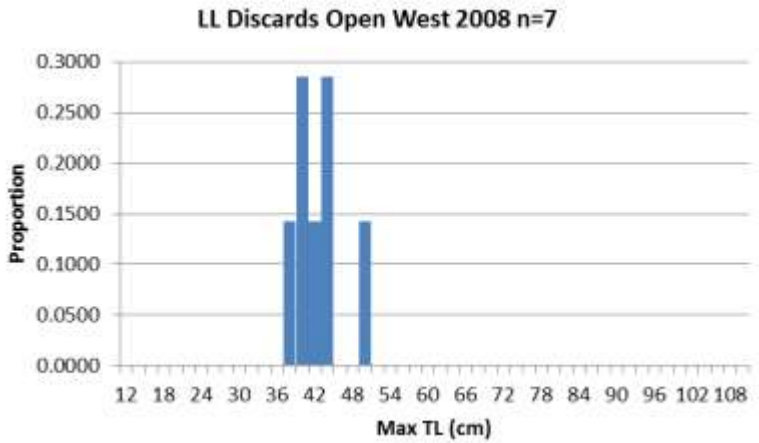
Size Composition of Landings (1984-)

- Commercial port samplers
  - attempt representative samples
- Recreational surveys
  - MRFSS/MRIP
  - Headboat survey
  - TPWD
  - FIN
- Sample size generally high
  - but low intercept rates for some species
- When and how to pool samples

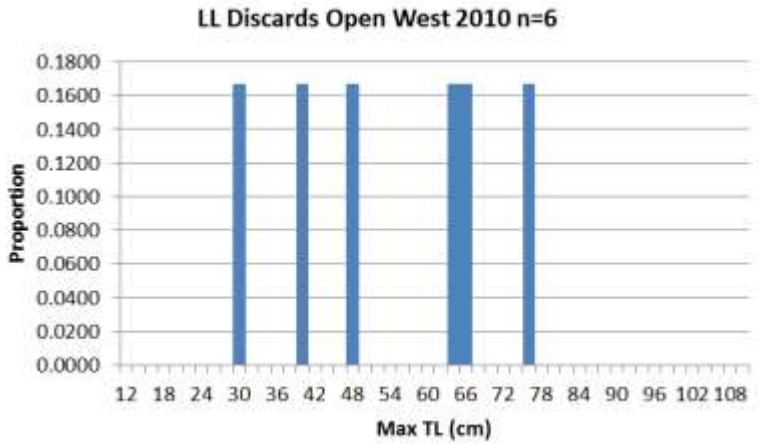


Size Composition of Discards

- Commercial (2007-)
  - Observer program
  - Low coverage of some sectors
  - Size comp. varies with IFQ allocation



- Recreational
  - Headboat observer program (2005-
  - Good coverage
  - Small segment of fishery



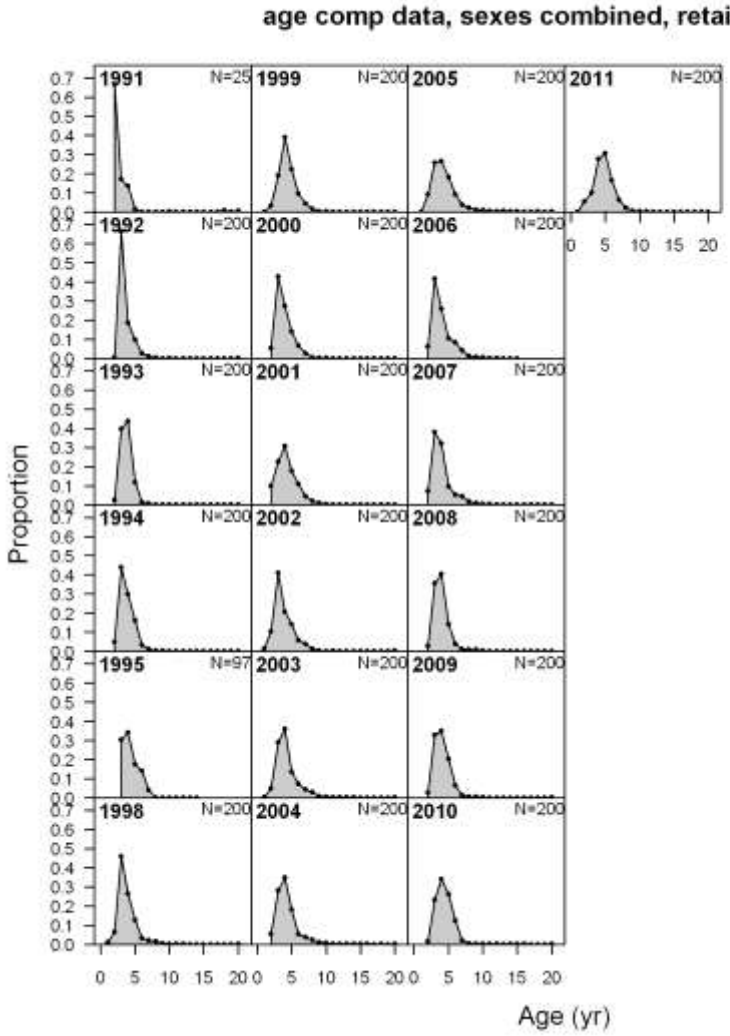
Age Composition of Landings

- Commercial (1991-)

  Recreational (1991-)
  - SEFSC (Beaufort, Panama City)
  - FIN
  - FWRI
- Sampling for most species

  intended to be representative
- Sampling for some (king mackerel)

  intended for age-length keys
- When and how to pool samples



Fishery CPUE (standardized indices of abundance)

Commercial logbooks (1990-)
Marine Recreational Survey Intercepts (1981-)
Headboat logbooks (1986 –)
Headboat observers (2005-)

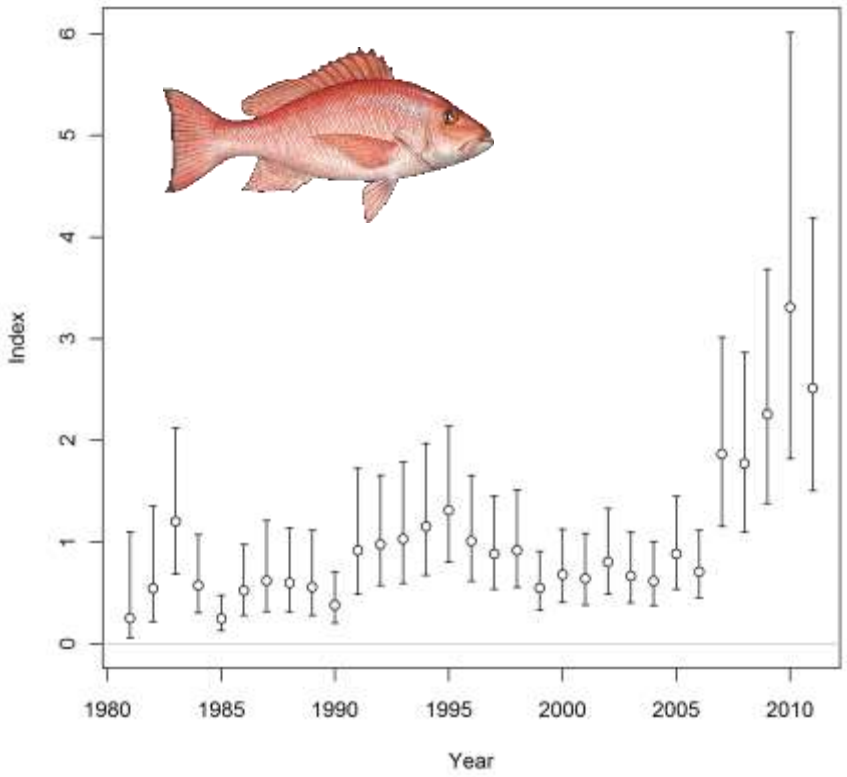
Low-moderate observation error

- many observations

High potential for process error

- limited spatial coverage
- changes in fishing power
- changes in regulations

MRIP Standardized CPUE

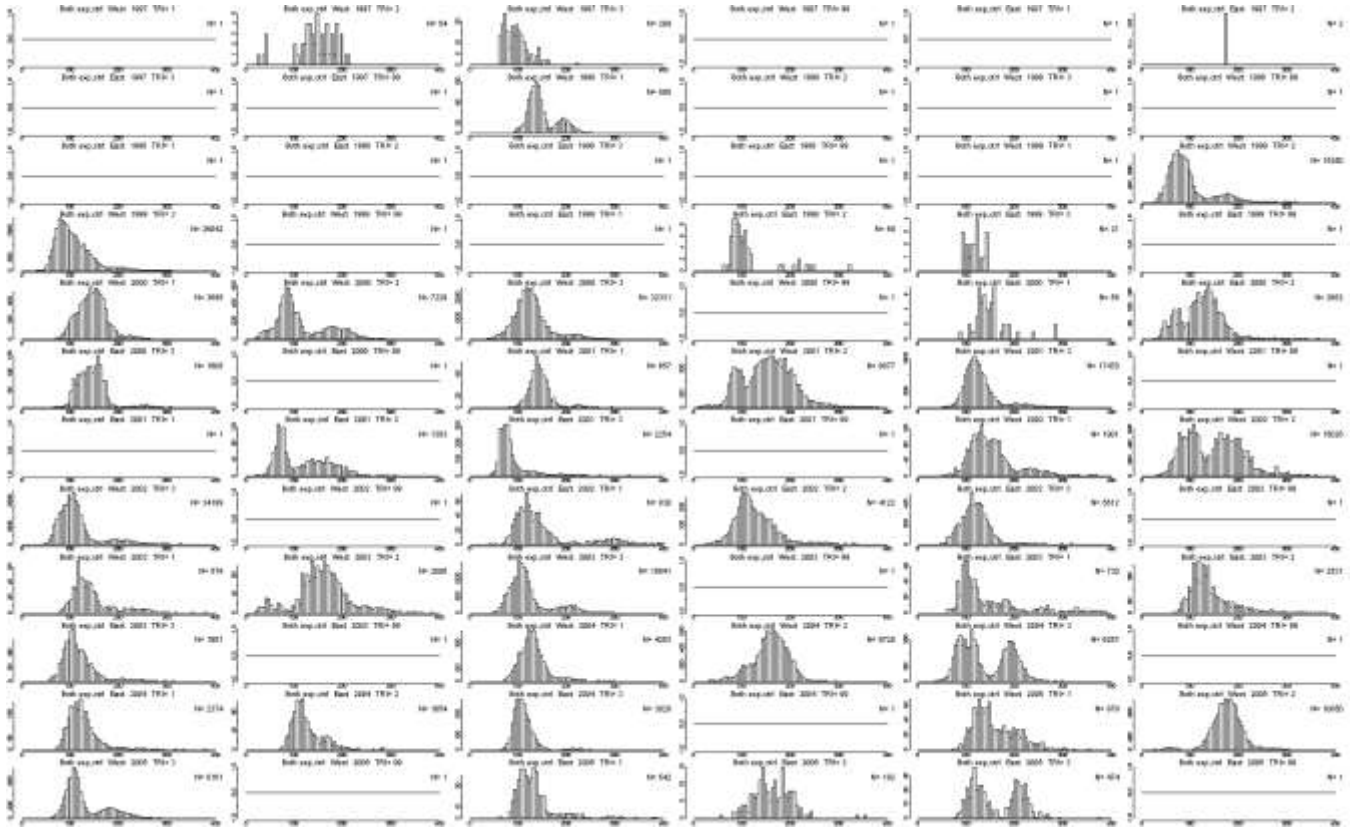


Bycatch of Shrimp Fleet

- Substantial bycatch of some species
- Annual estimates highly uncertain
  - (e.g., CVs > 200%)
- Some assessments handle this by fitting to the
  - effort series (to index trends in F)
  - Median bycatch (to scale F)

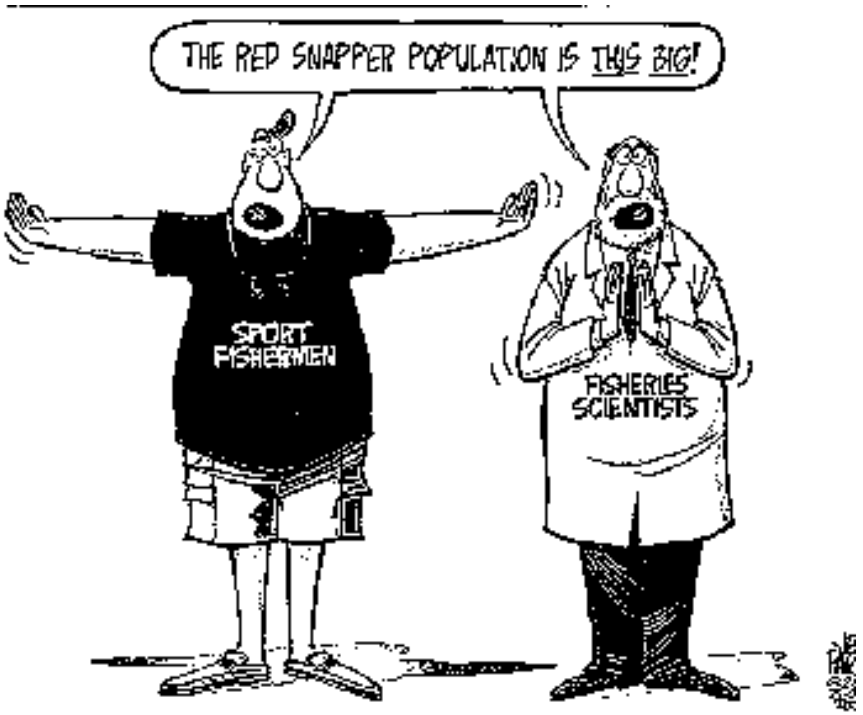
Shrimp Bycatch Size Comps (1997-)

- Shrimp observer program
- Used indirectly to obtain shrimp bycatch age comps



Available Fishery Independent Statistics

- Indices of abundance
- Size composition
- Age composition



Fishery Independent – Gulf of Mexico

SEAMAP Video (1993–)

NMFS/FWRI Video (year….)

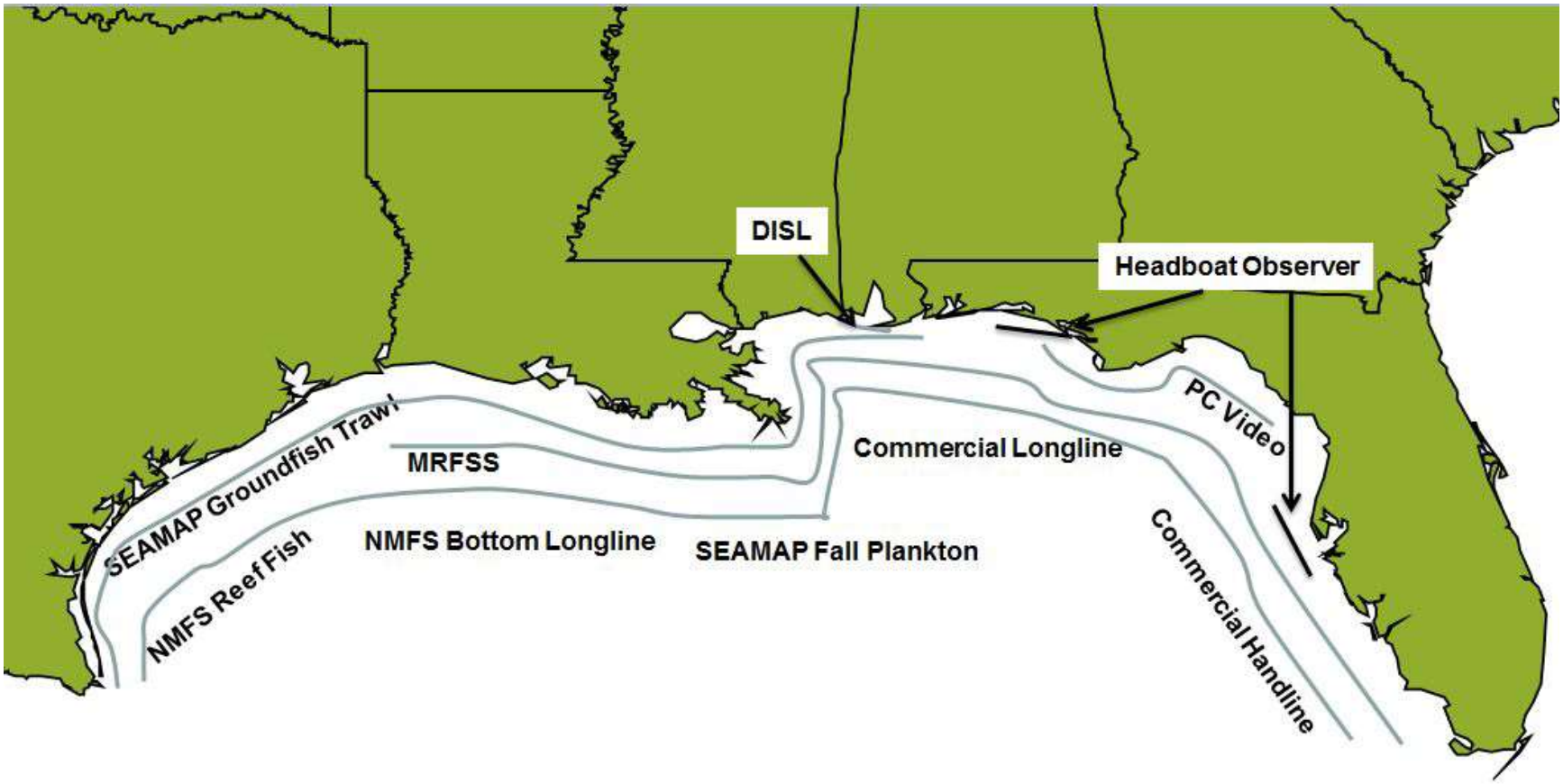
SEAMAP Plankton (1986–)

SEAMAP Summer Groundfish Trawl (1982 –)

SEAMAP Fall Groundfish Trawl (1972 –)

SEAMAP bottom longline w/ supplemental sampling (1996–)

Fishery Independent – Gulf of Mexico

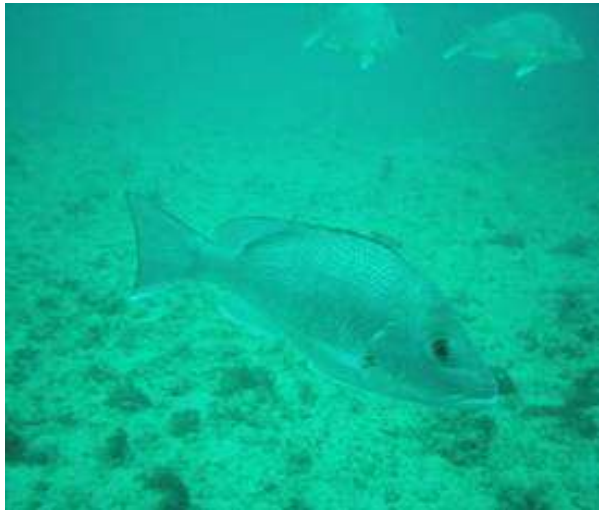


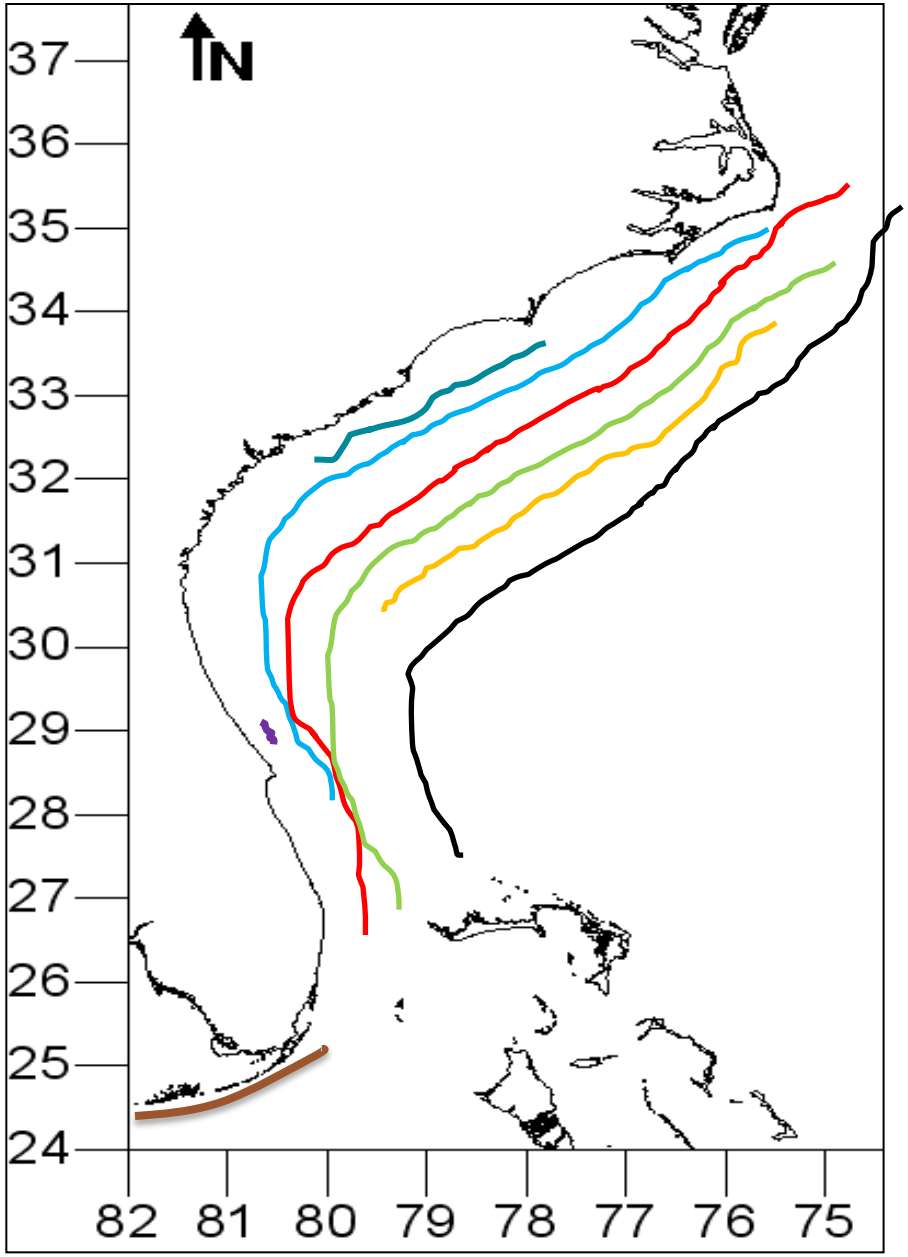
Fishery Independent – South Atlantic

Chevron Trap Survey (1990 – present)

Video (on chevron traps) Survey (2010 – present)

Coastal Trawl Survey (1986 – present)





Fishery Independent Indices

SEAMAP Shallow Trawl

MARMAP FS/BF

MARMAP Chevron

Florida Keys Reef RVC

Fishery Dependent Indices

Commercial Logbook

Pot Fishery (single fisherman)

Headboat

Headboat Discard

SC Charter

Ex:

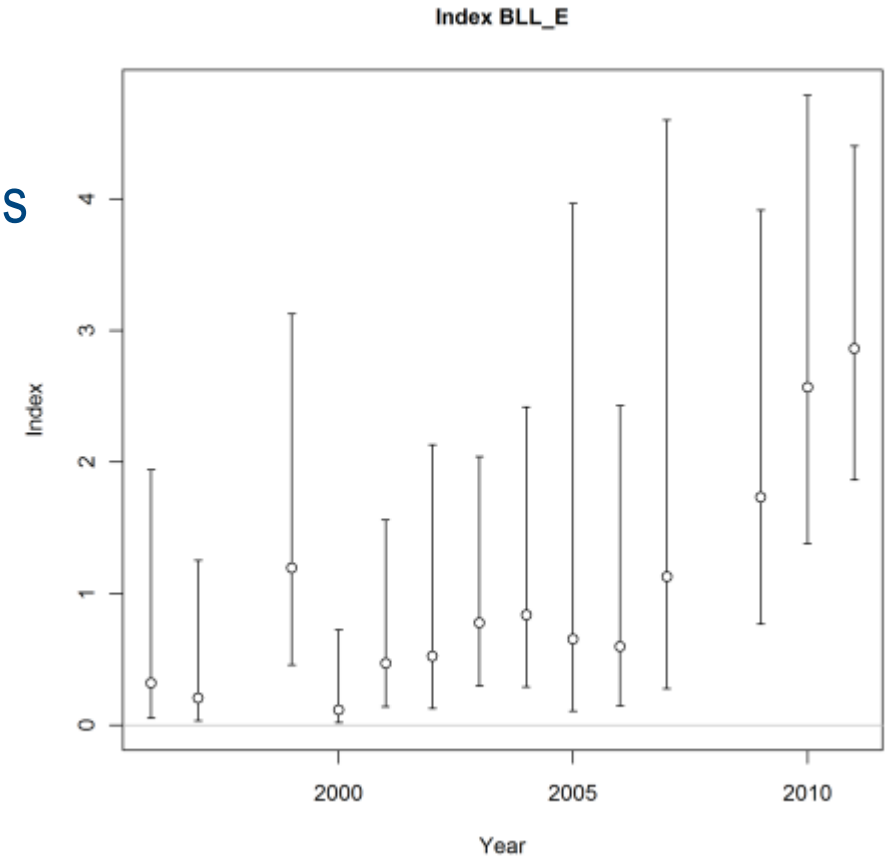
Fishery Independent Indices of Abundance

Observation error

- Lower number of observations than CPUE

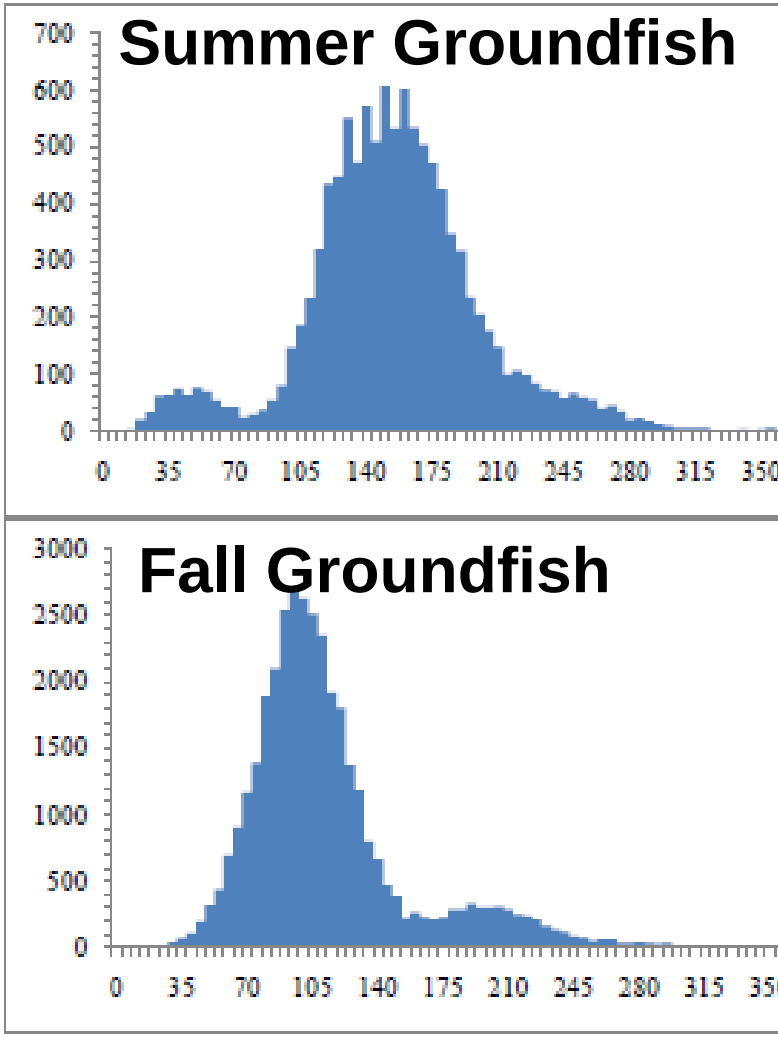
Process error

- limited spatial coverage
- only minor changes in fishing power



Fishery Independent Size Composition

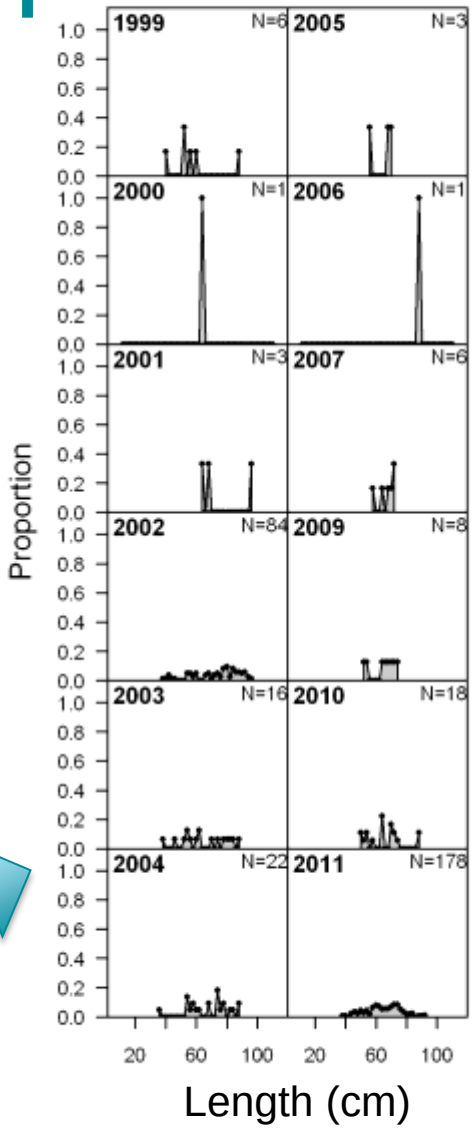
- Constant selectivity through time helps ground stock assessments
- In some cases the contact selectivity can be estimated external to the assessment model



Fishery Independent Size Composition

- Constant selectivity through time helps ground stock assessments
- In some cases the contact selectivity can be estimated external to the assessment model
- Sample sizes low for some species in some surveys

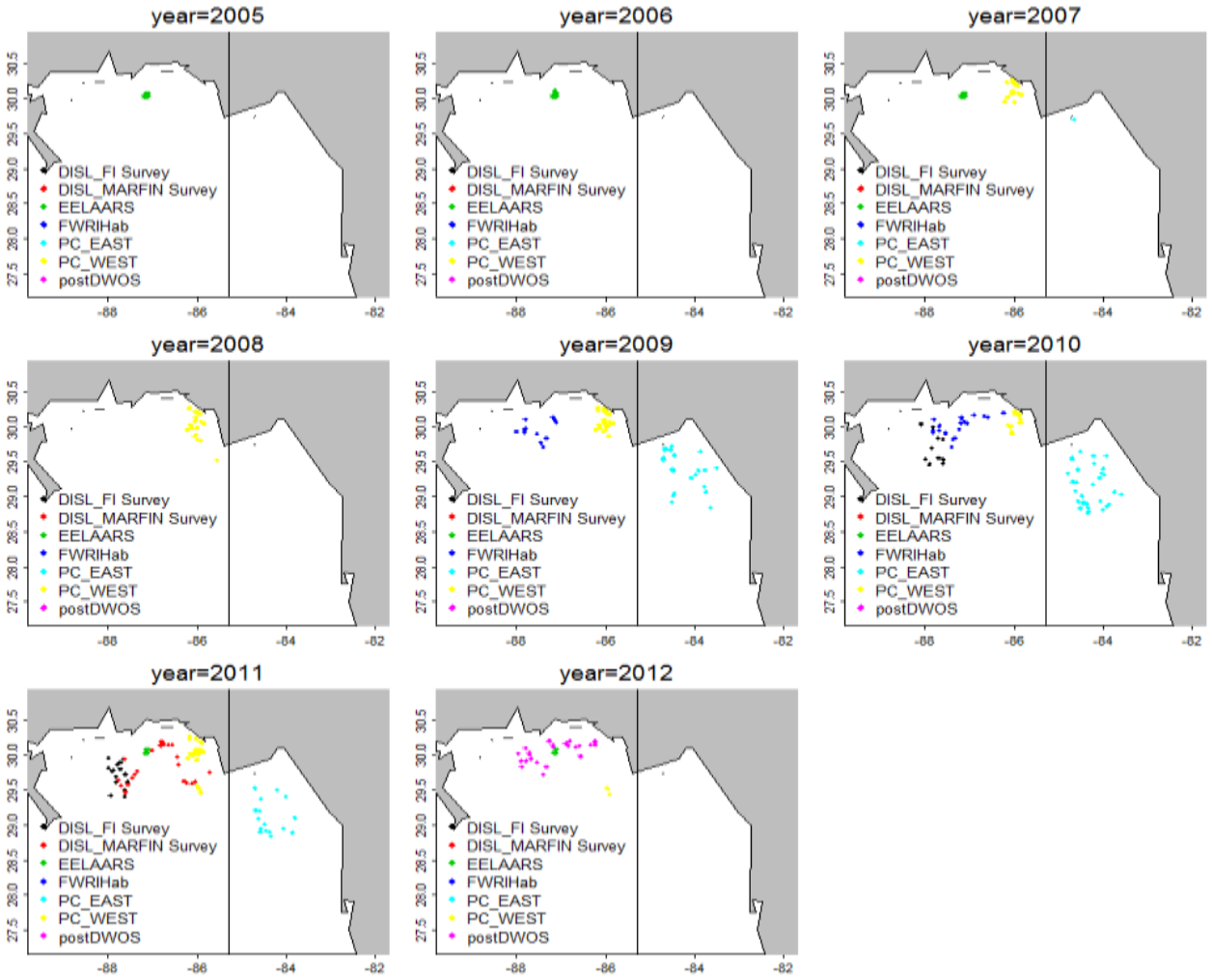
  Ex. NMFS BLL EAST Red Snapper

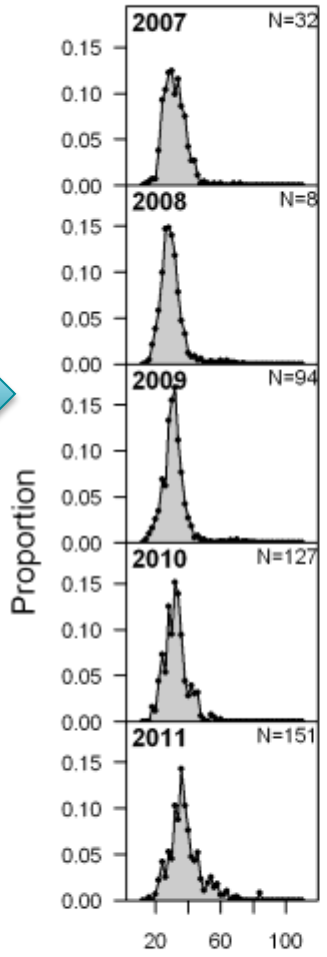


Smaller-Scale and short-term surveys

- University of West Florida surveys (e.g., Patterson et al. 2009)
- Dauphin Island Sea Lab (DISL) surveys
- Panama City ROV studies
- Panama City NMFS stationary camera survey
- NMFS/UM RVC survey Florida Keys
- 2010 longline survey SATL slope
- Various other state and university-sponsored surveys

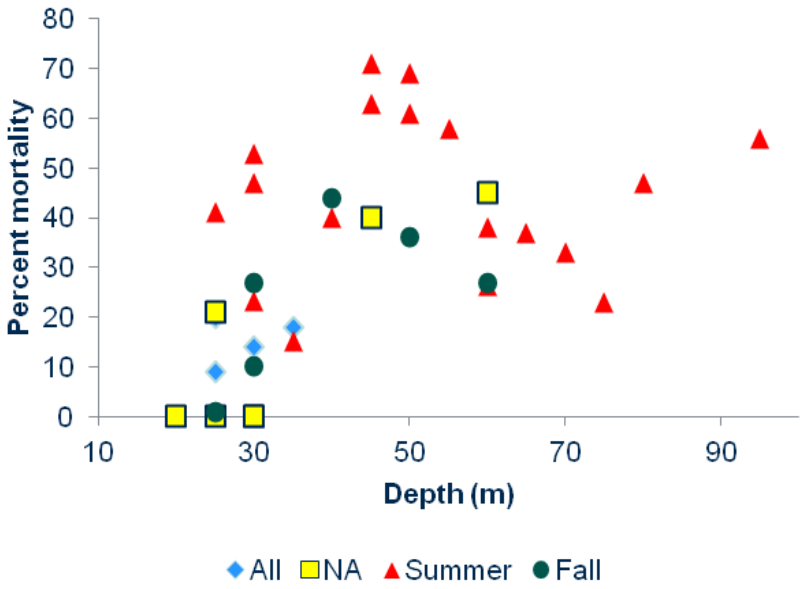
Combining multiple local indices



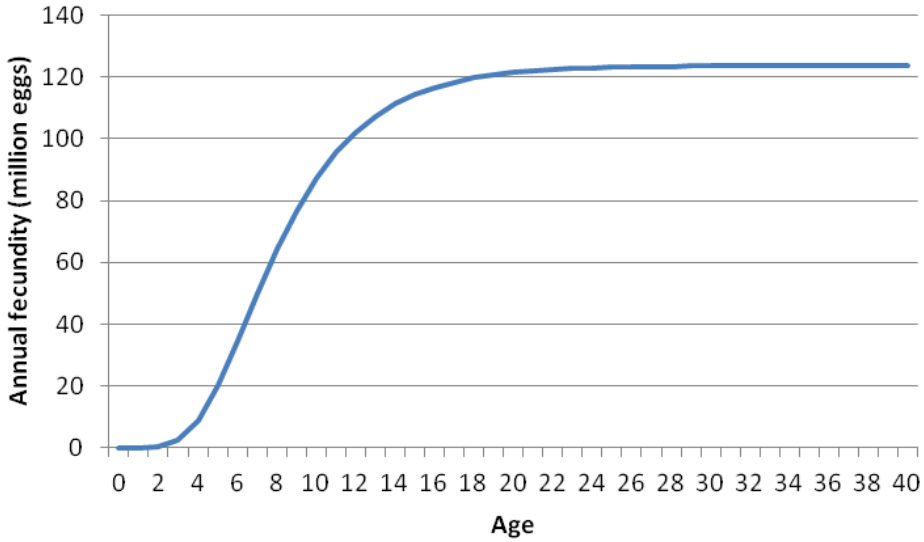


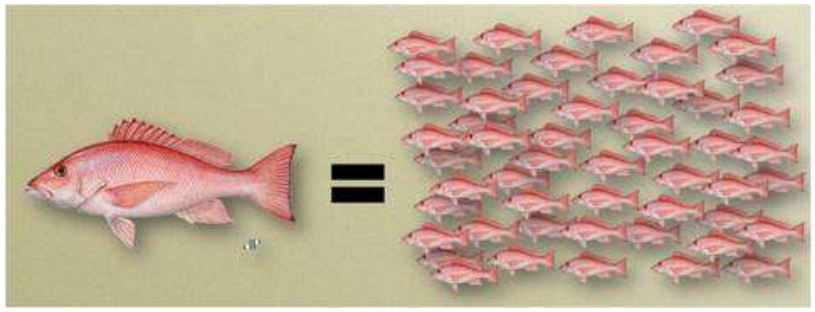
Life history information

Discard mortality



Fecundity

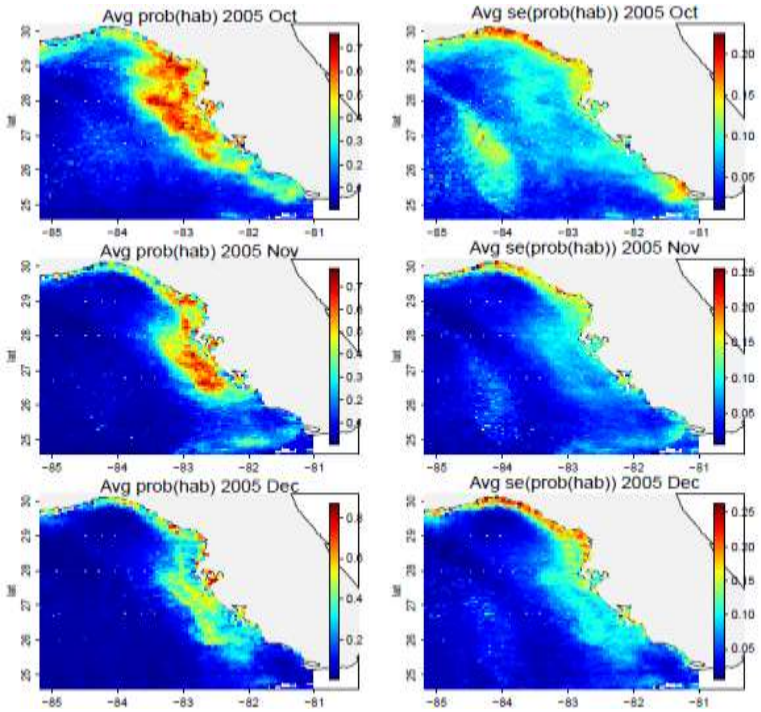


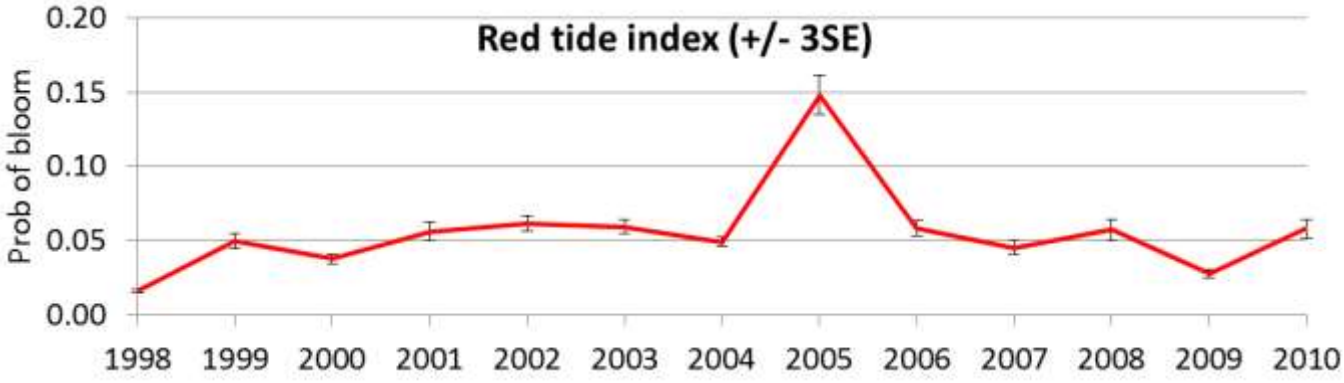


Environmental covariates

Example. Satellite-derived model of probability of red tide used to develop an index of red tide 1998-2010.

Critical input to gag and red grouper assessments and IEA models





Take home points

Fishery-Independent (FI) data

- Insufficient sample size (high CV)
- Insufficient characterization of habitat (inefficient design)
- Short time series (e.g. SATL video data in only 3rd year of operation)
- Spatial, depth and temporal gaps
  - SATL: no consistent data collection in deeper water (no FI data for several assessed species.
  - GULF: large sections of shelf not sampled by several surveys
  - Gaps due to weather / vessel breakdown
- Limited species coverage
  - e.g., Chevron trap index limited to few reef species and may not always track abundance (1990-present)

Take home points

Commercial landings

- Census of fish dealers
- Gaps in early years
- Some unreported landings (e.g., sold directly to restaurants)

Commercial Discards

- Limited observer coverage in Gulf of Mexico
  - Incomplete spatial coverage (especially in early years)
  - Little size information for some species, no age data
- No observer coverage in South Atlantic region
- Effort entirely based on self-reported data (logbooks)

Take home points

Recreational Landings and Discards

- Charter/Private Boats can account for 50% or more of total landings and discards for most reef fishes
- Effort based on self-reported data (recall from phone surveys, headboat logbooks)
- Many reef fishes tend to have very low intercept rates (landings)
  - Large CI's, few length samples from landings in some years
  - Few age samples from landings, esp. in South Atlantic region
- Discards based on recall and largely self-reported
  - No length or age samples
  - Few age samples, esp. in South Atlantic region
  - Exception: Headboat observer program (small fraction of fishery)

Take home points

Age Information (commercial and recreational)

- Sample sizes generally too low, but over-sampling of some species in Gulf of Mexico (e.g., red snapper)
- Possibly biased sampling of ages (representative age-length keys versus representative age composition)
- Sampling effort not distributed very well across states
- Few age validation studies, incomplete standardization among readers

Take home points

Spatial and Reproductive Information

- Outdated or limited reproductive information for some species
- Spatial information limited to self-reported logbooks on coarse spatial scale
- Movement patterns largely unknown for most species
- Complete reproductive cycle largely unknown for most species; additional challenges for understanding protogynous stocks

Shared Stocks